HRS Detector Package and Installation

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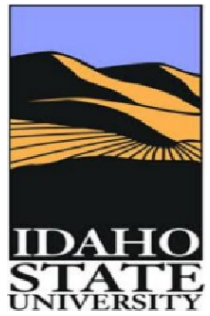
Feb 15 - 16, 2019

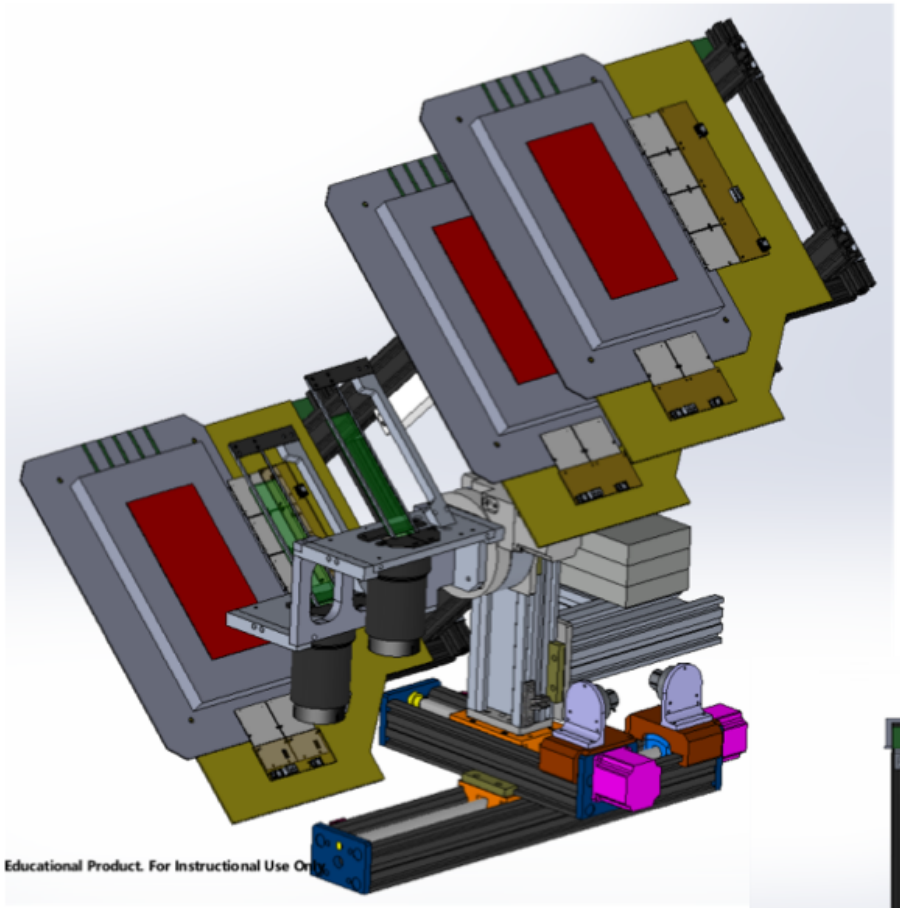


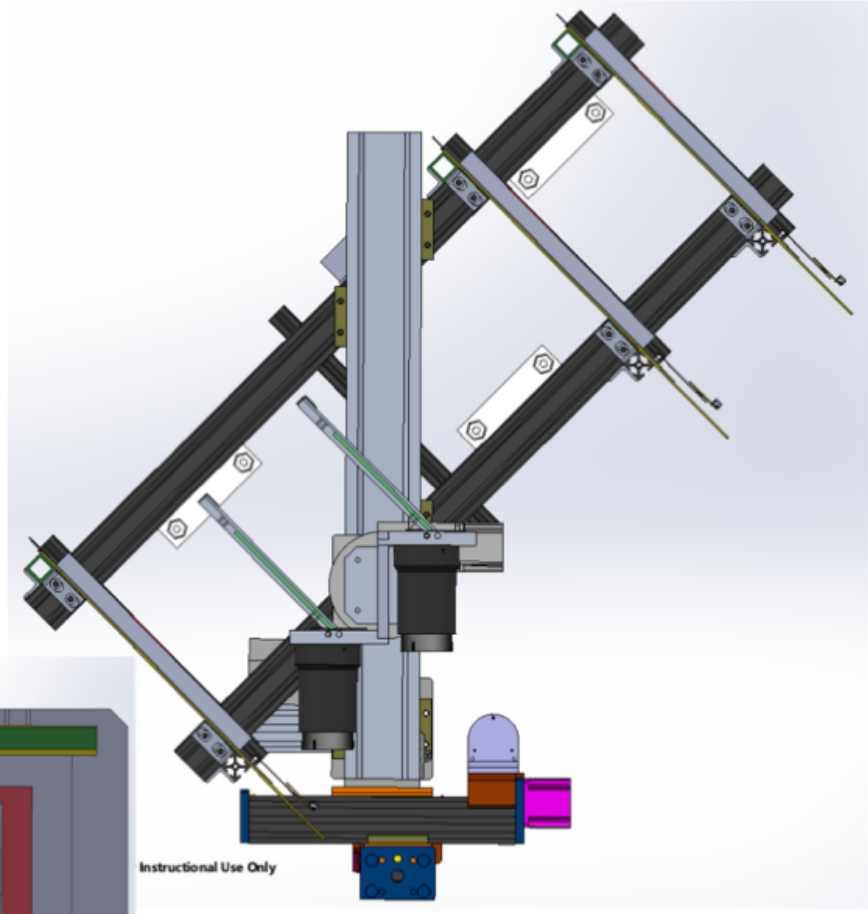
HRS Detector Package and Installation

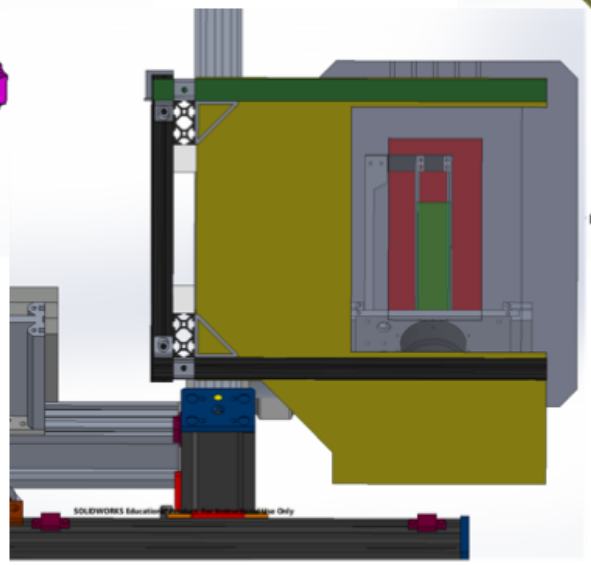
Talk Outline:

- HRS Detector Package
- What we have/what we still need
- SLAC testbeam and Jlab pre-staging
- A_T and installation plans
- Summary

RHRS Tandem Quartz Mount with GEMs

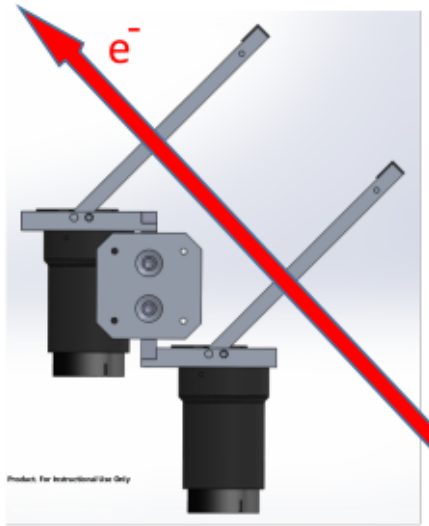


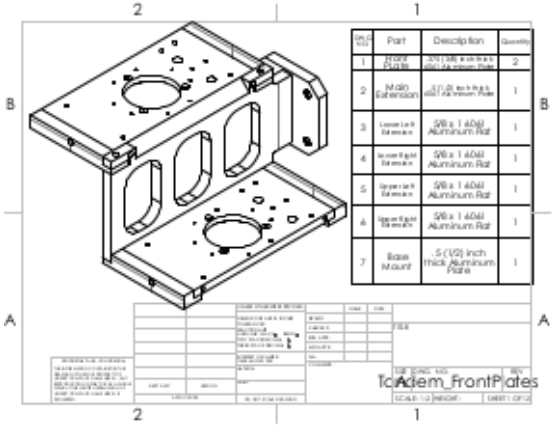


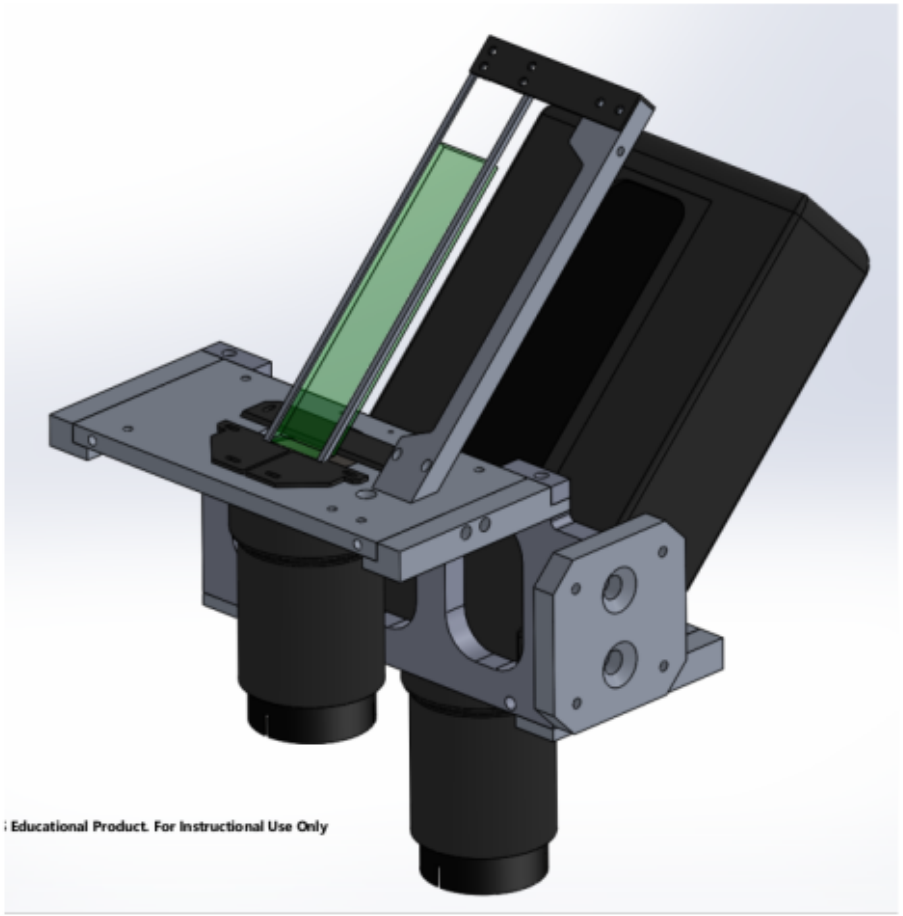


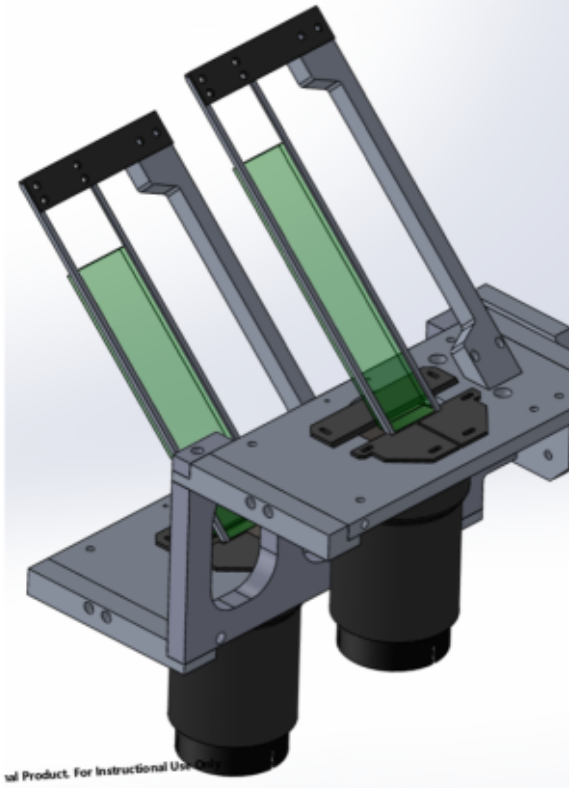
Electron's view (from below)

Main Integrating Tandem Detector Design







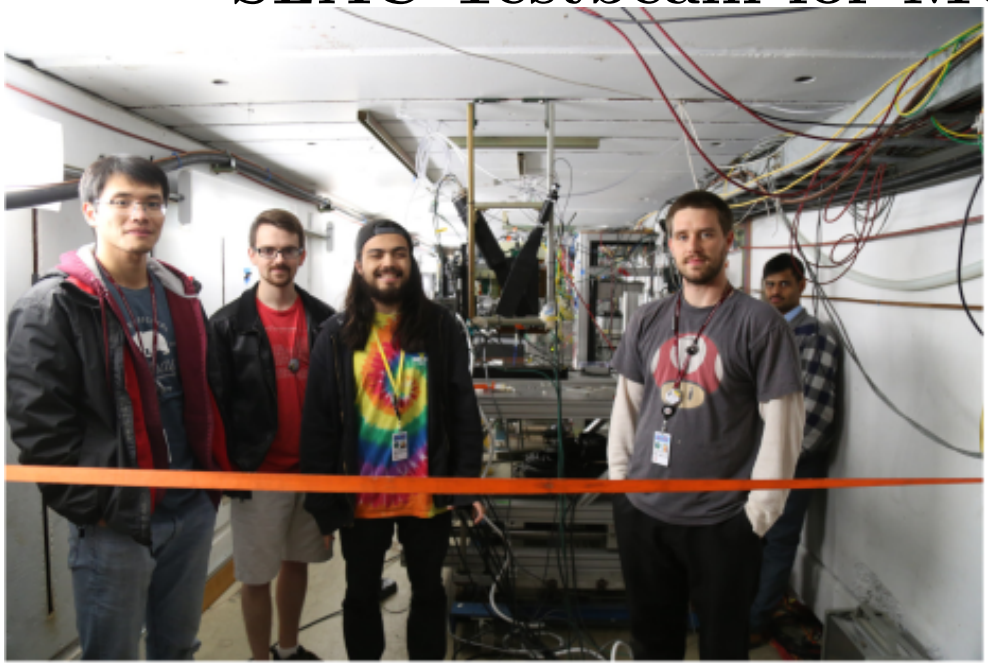


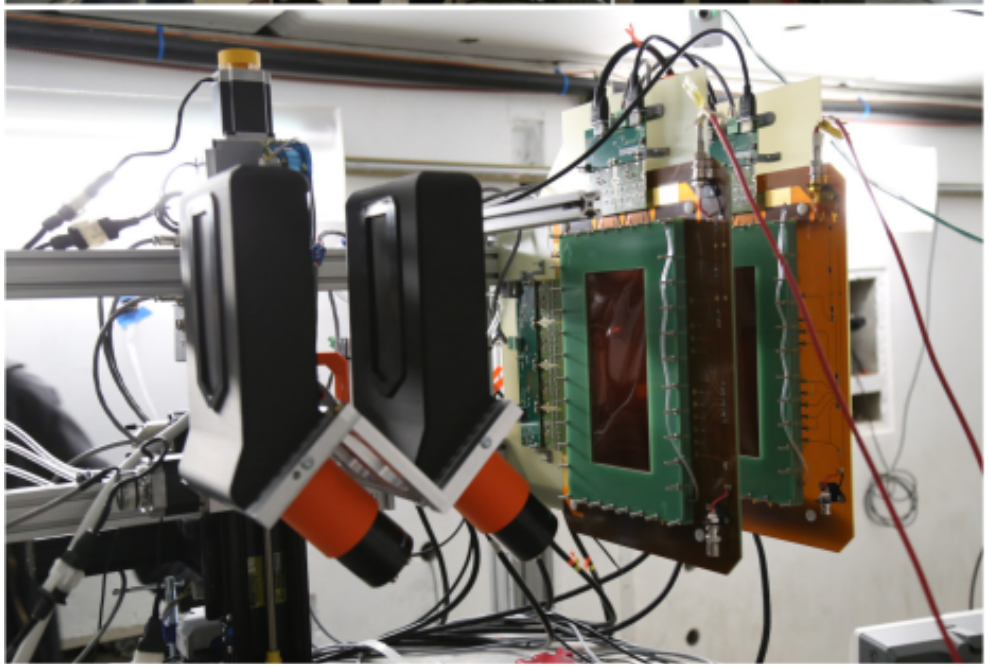
- Both Left and Right HRS main detectors are assembled and ~ready to go
- PREX will use 5 mm thick quartz for all detectors
- CREX will use 6 mm thick quartz upstream and 10 mm downstream

Main and A_T Det Components: What we have & what we need

- Left and right arm tandem detectors and mounts complete
- A_T detector parts in production—using same design as main detector; mounts are being designed (based on PREX-I experience); Ryan will spearhead this effort – finalize the HRS hut CAD to determine A_T mount dimensions and placement (in combination with his A_T optics MC studies)
- Detector components in hand: Everything except quartz – we have all PMTs, bases, mu-metal shields, and misc parts
- Quartz geometry finalized for main and A_T detectors. Will use 5 mm by 35 mm by 160 mm; two pieces purchased this fall (but not in time for SLAC testbeam). A purchase of 7 more pieces initiated – should have by May 1
- We also need to purchase the "stubby" quartz pieces (for alignment validation during commissioning). Will initiate this order next week (should also have by May 1)
- All motion system components in hand. Only issue here is we're short two position transducers (we need 12 and have 10). I will investigate alternative options here.

SLAC Testbeam for MOLLER (PREX tests)





SLAC Testbeam (Dec 6 – 12, 2018):

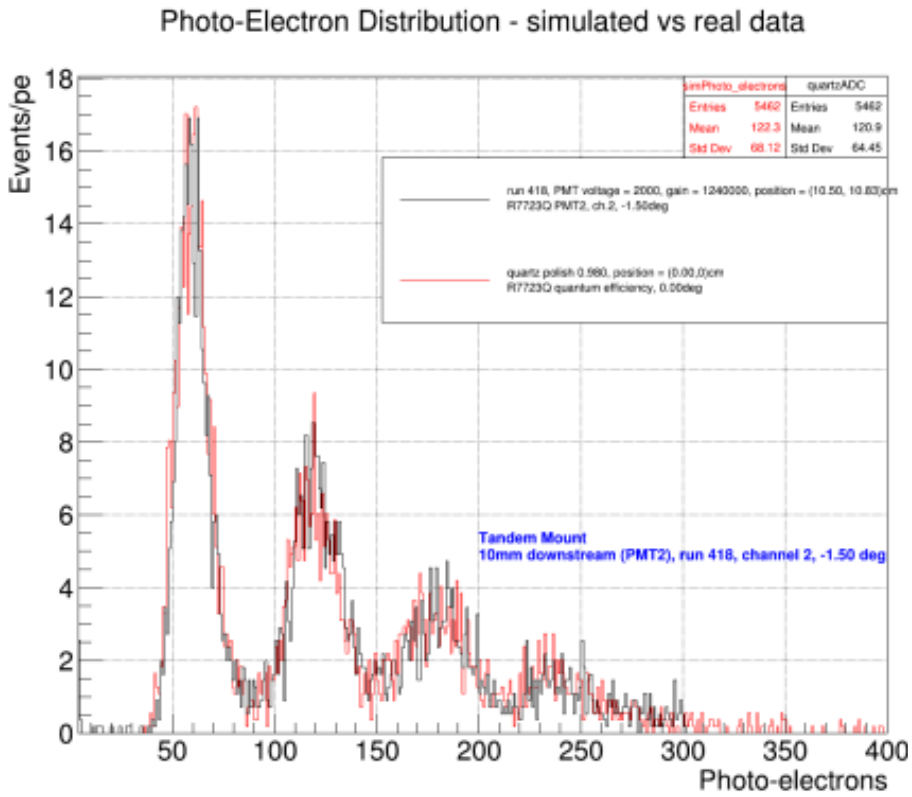
--3, 5.5, and 8 GeV electrons

--5 Hz event rate

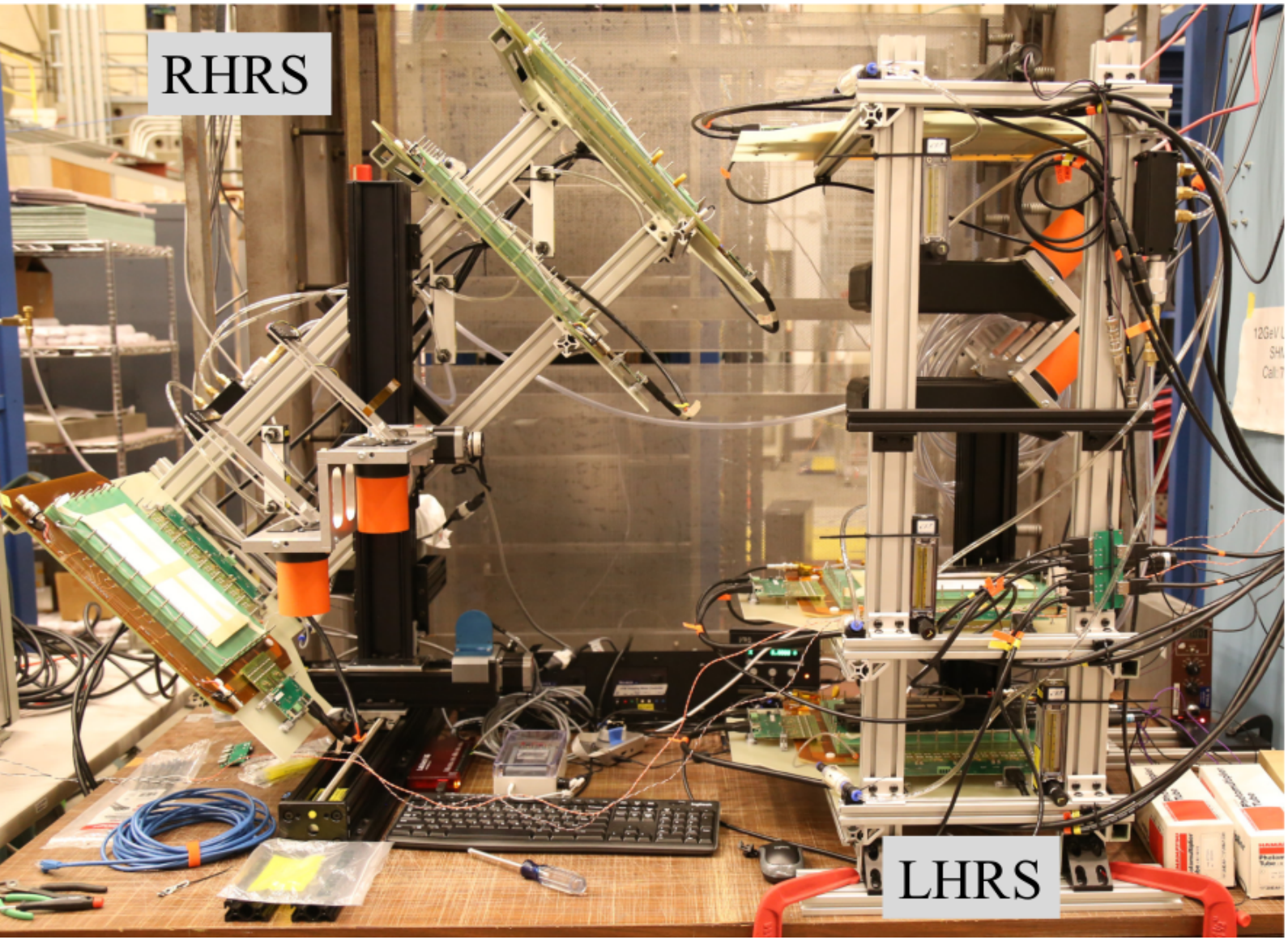
--Beam electron multiplicity follows Poissonian with mean near 1

--Primarily for Shower-max tests

--PREX det. tests on Dec 11 at 8 GeV



Testlab Setup (over winter break)

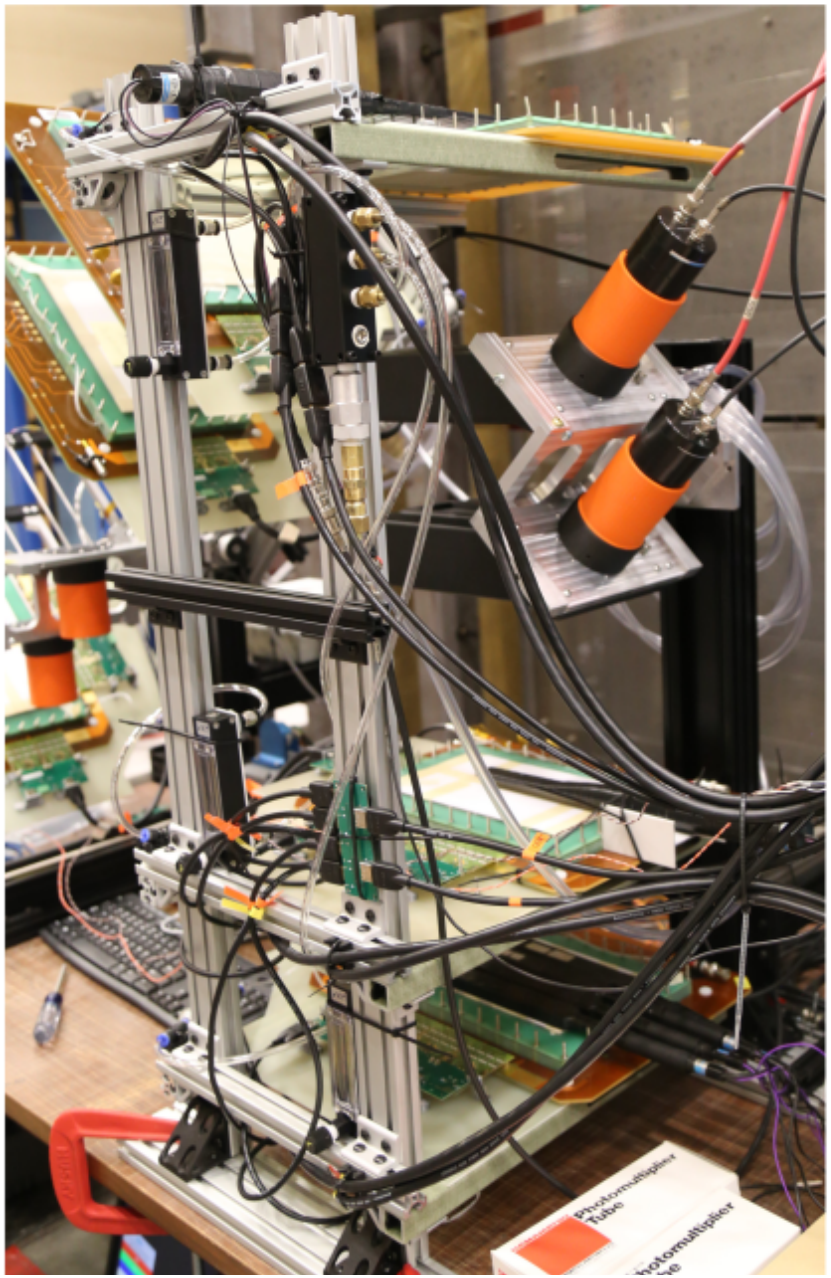


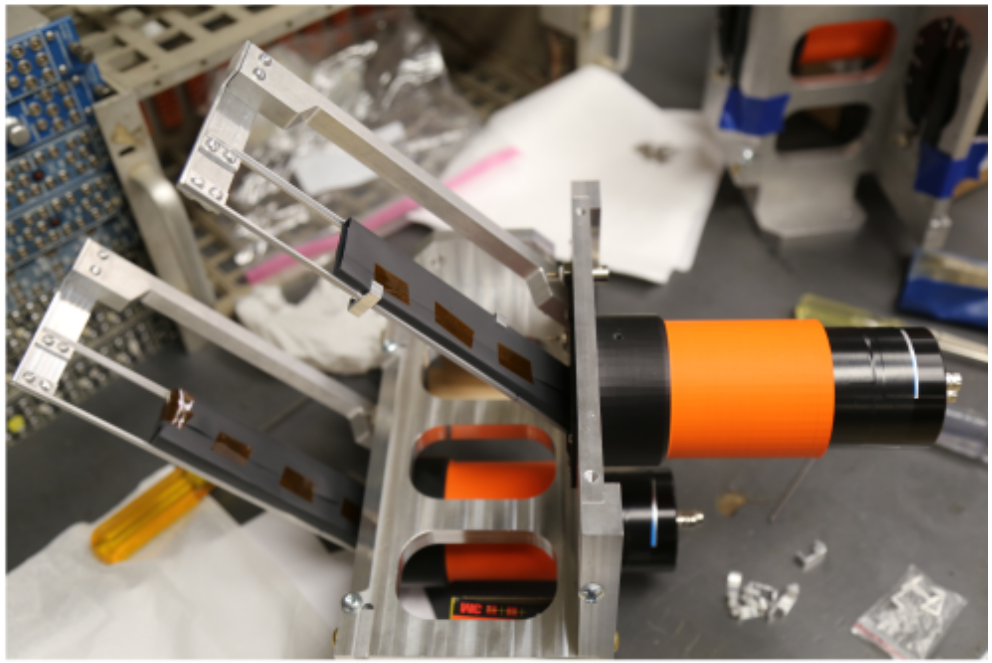
Chandan Ghosh
Tao Ye
Cameron Clarke
Devi Adhikari

Goals:

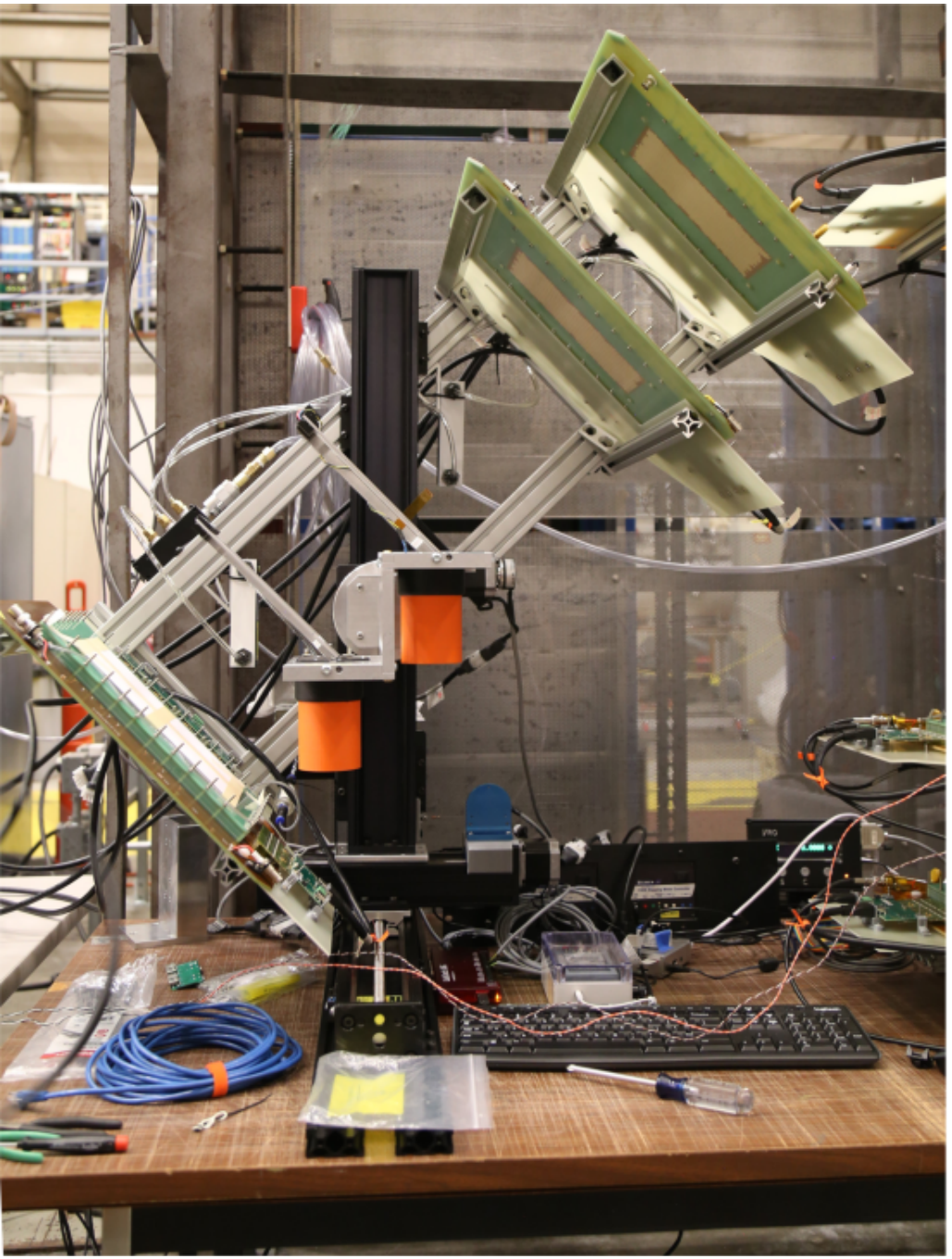
--Develop GEM analyzer and incorporate into Hall A analyzer
--Measure efficiency of GEMs
--Finalize and test motion systems (GUI development)

LHRS GEM stand in Cosmic-ray mode





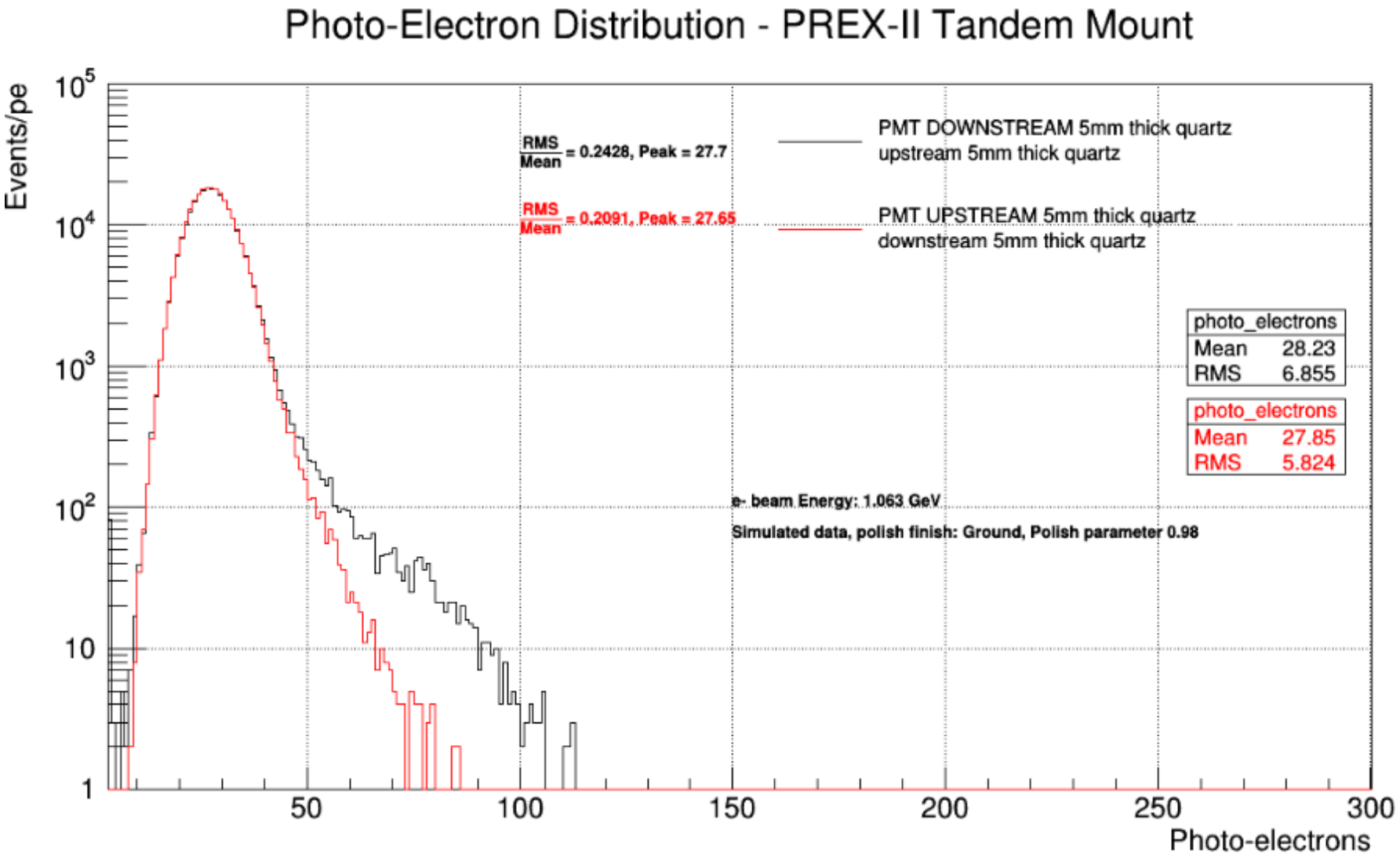
- PREX-II will use 5mm thick quartz. Have two pieces in hand and 7 more delivered by May 1
- Main and A_T detectors will use R7723Q pmts. Have all needed PMTs and bases in hand



RHRS Detector stand and motion system

- Stand assembled; GEMs installed
- Motion system complete with control GUI
- RHRS tandem quartz dets nearly complete; still need to install LEDs and covers
- Have acquired all existing remnants of PREX-I motion system
- Juliette has shipped remaining motion system components to Jlab

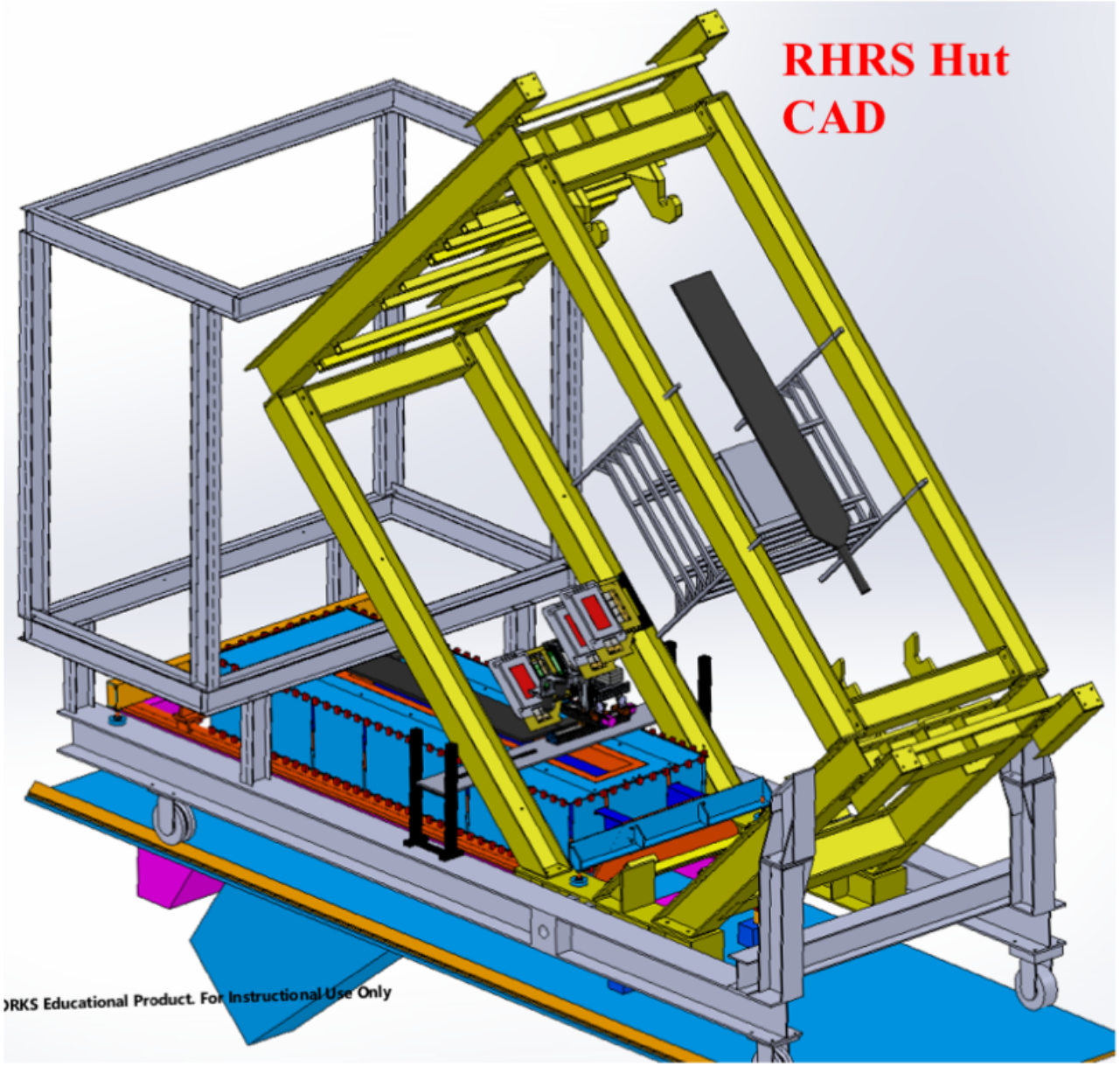
5 mm thick Quartz Simulation Results



- Upstream quartz 5 mm thick: 28 PEs with 21% resolution
- Downstream quartz 5 mm thick: 28 PEs with 24% resolution

HRS Det Package (old GEM frame; no A_T dets)

- All HRS standard detector packages removed except for VDCs: No S1, S2, Cerenkov, or Calorimeter
- For event-mode operation: Use S3 (or S0) for triggering
- Additional array of large GEMs from UVA group installed above PREX detector package
- A_T detector not shown: will mount just above small GEMs
- Plan to reuse same hardware and mounting/installation concept developed for PREX-I



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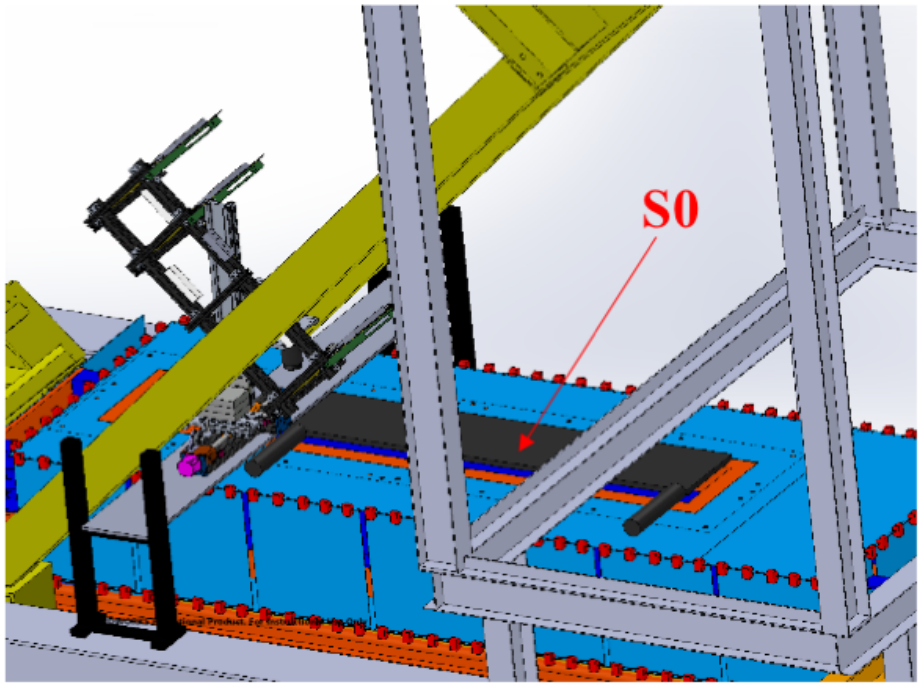
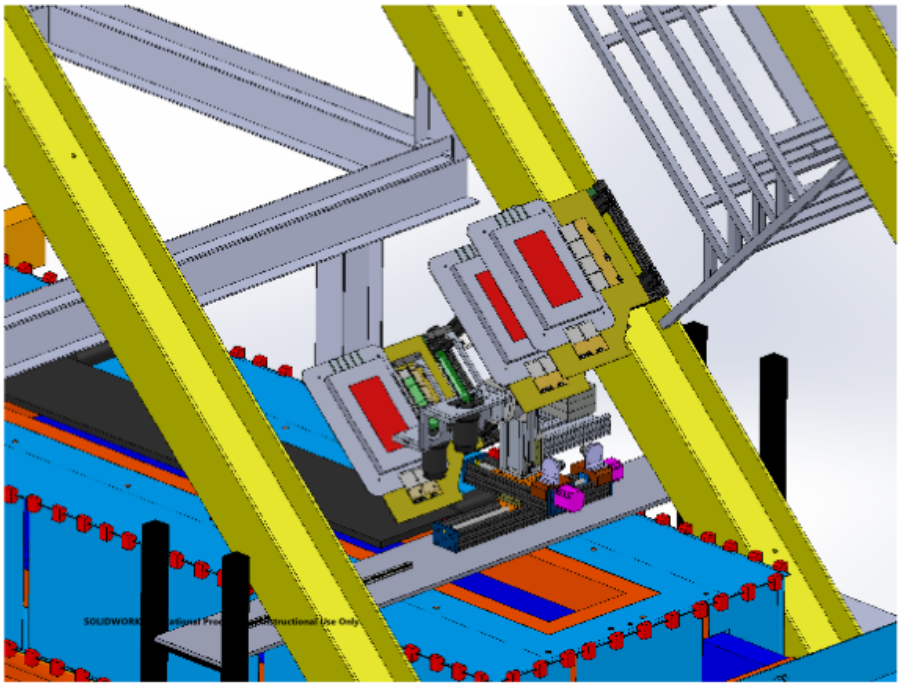
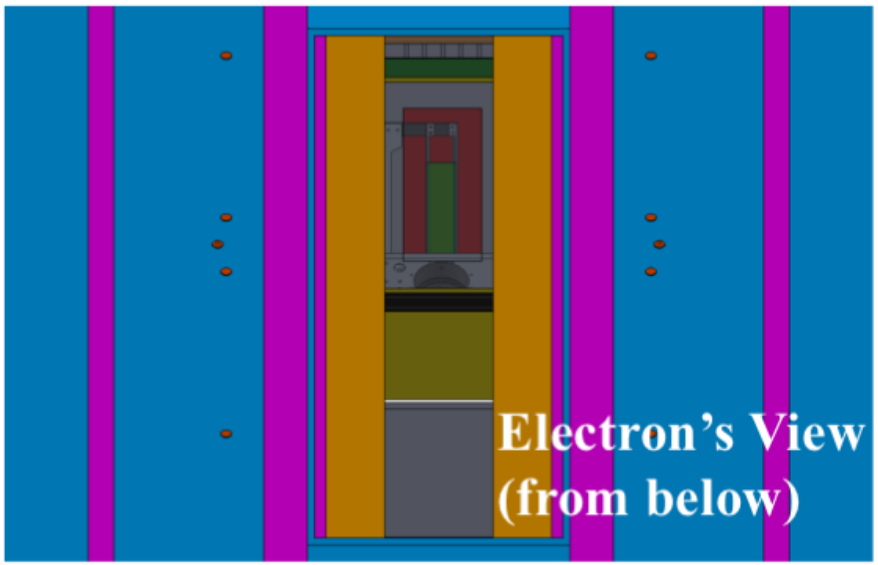
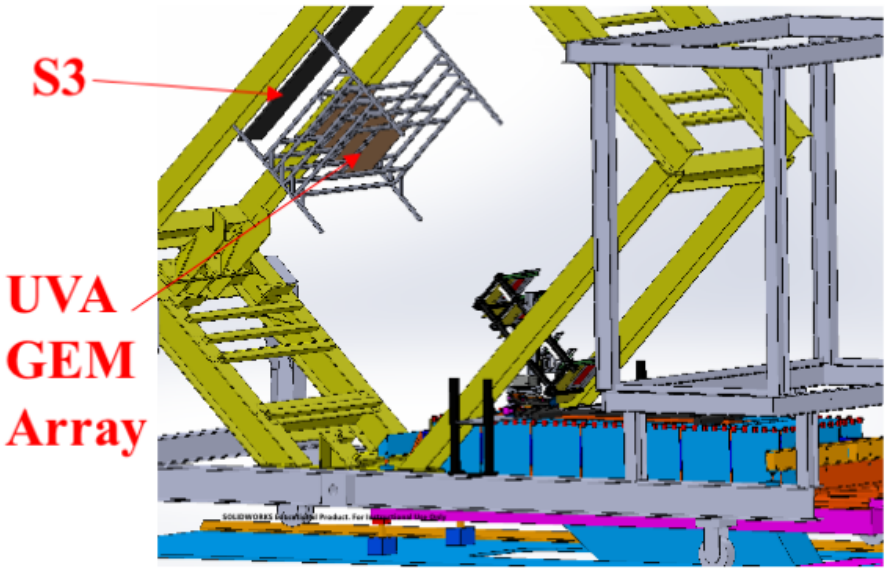
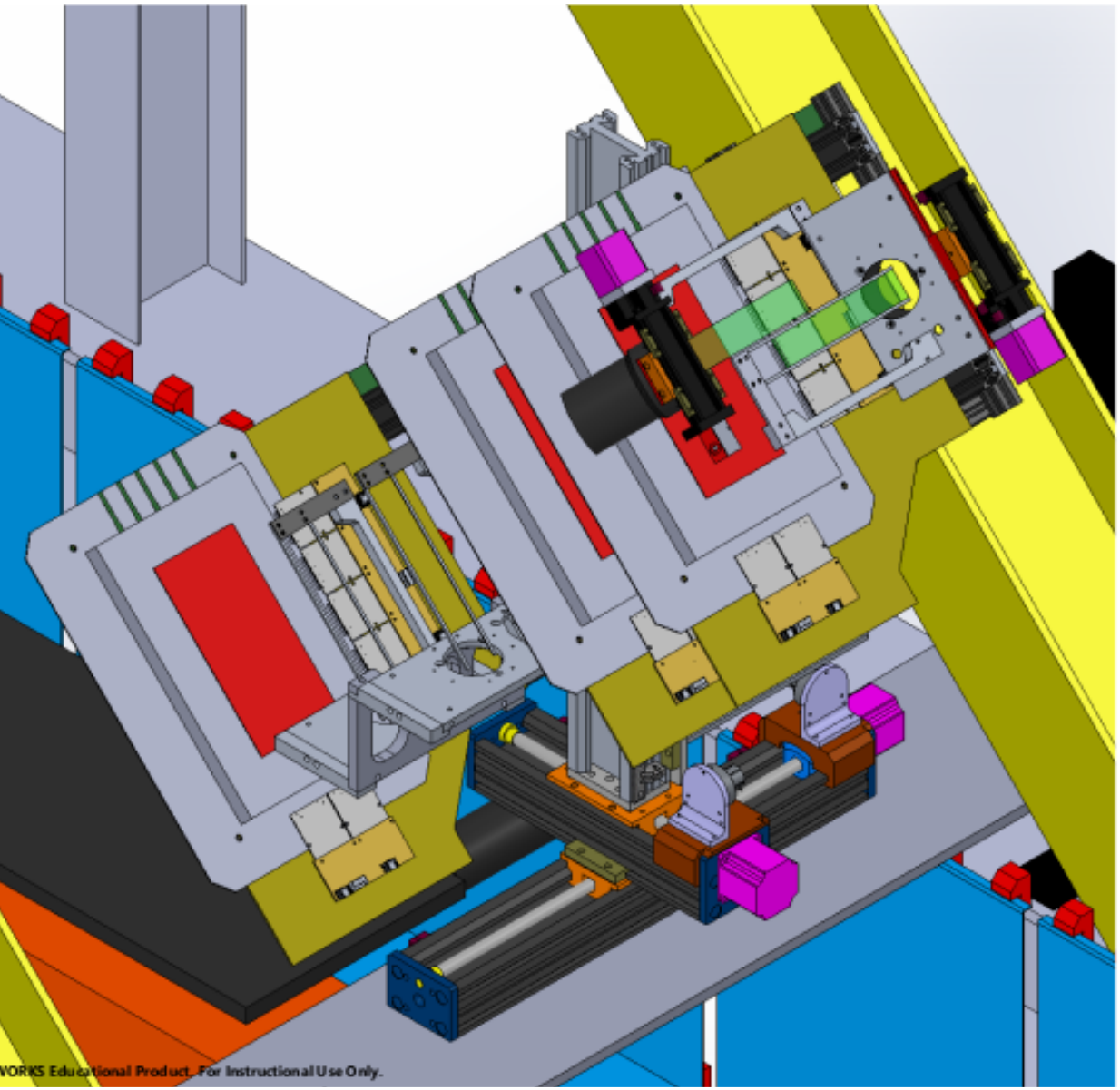


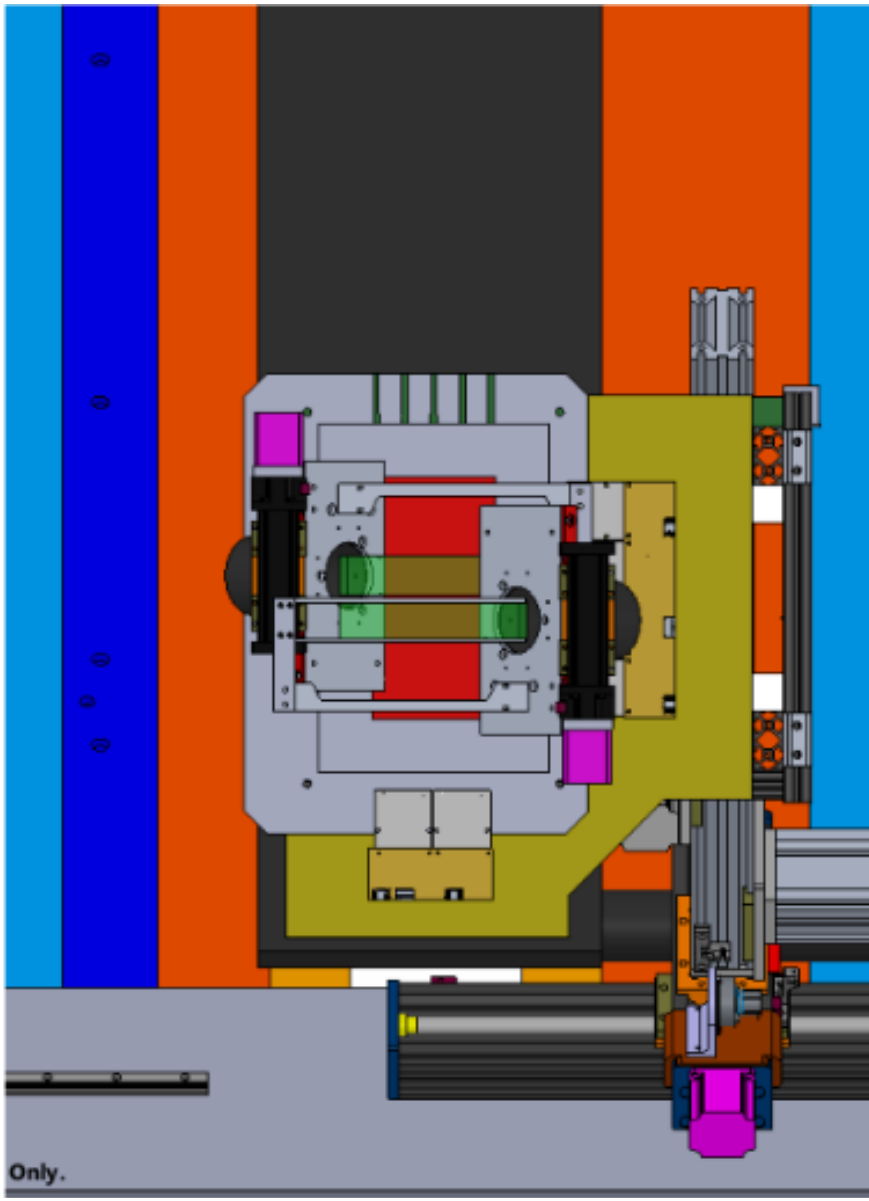






Prel. New HRS CAD with rough A_T concept





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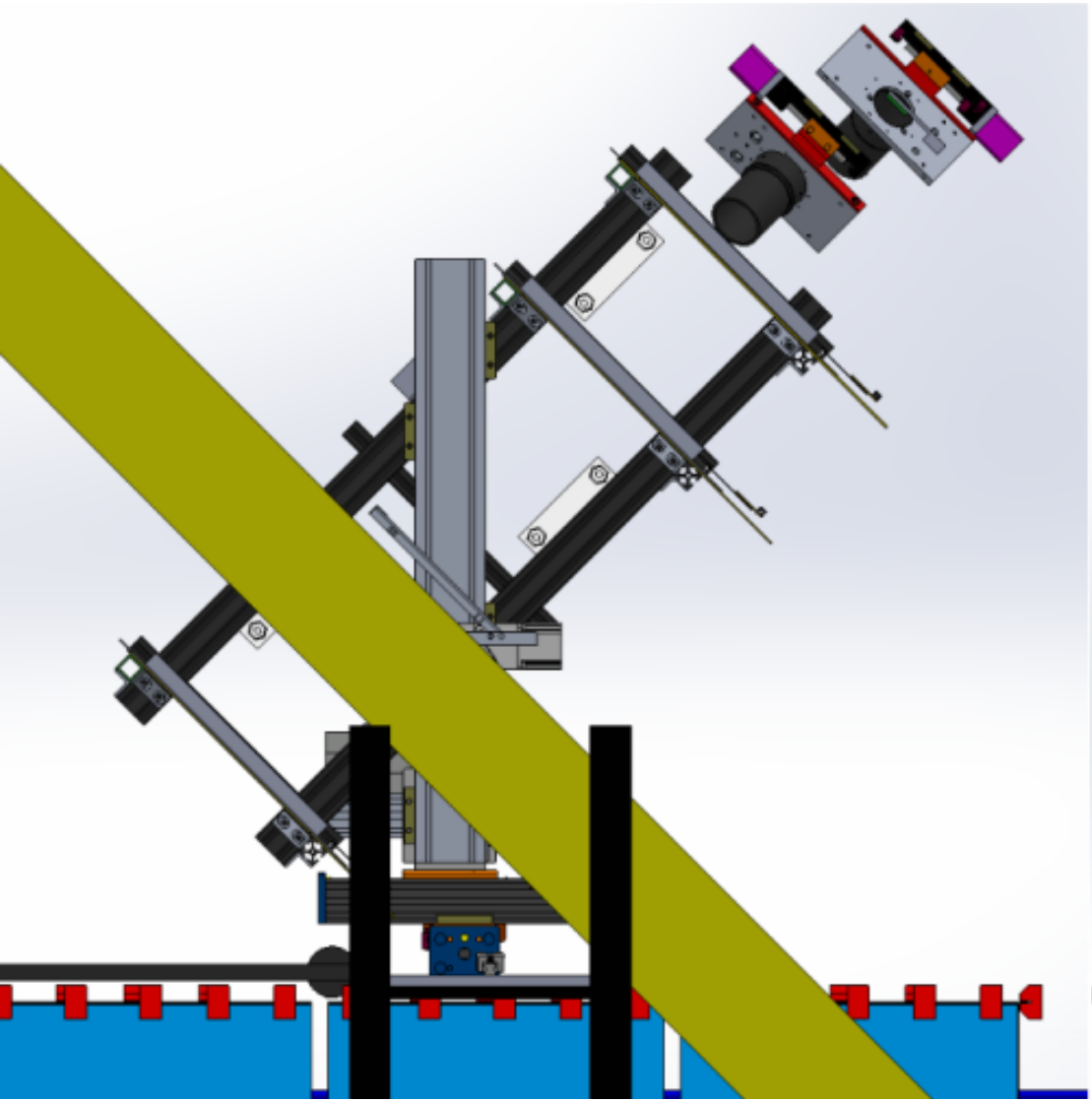

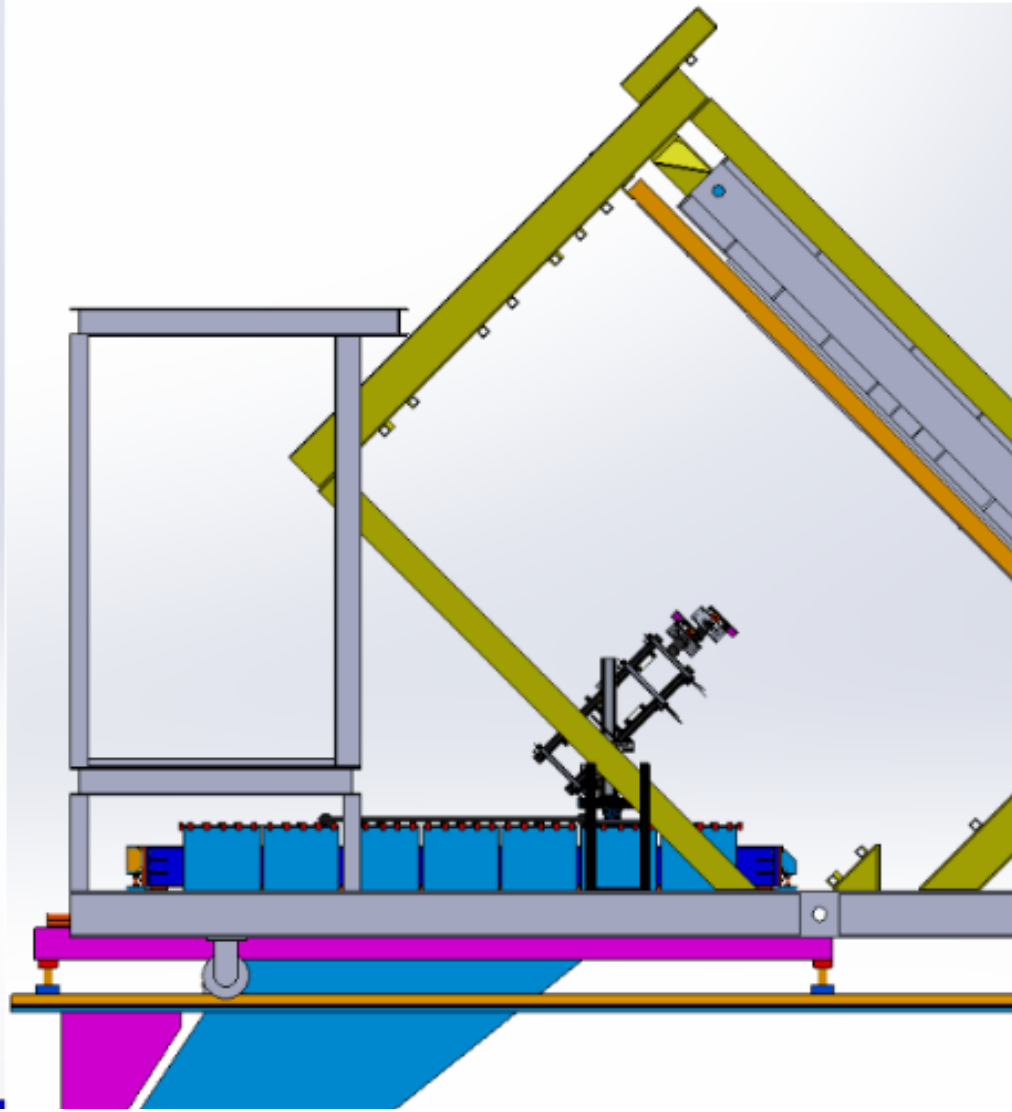

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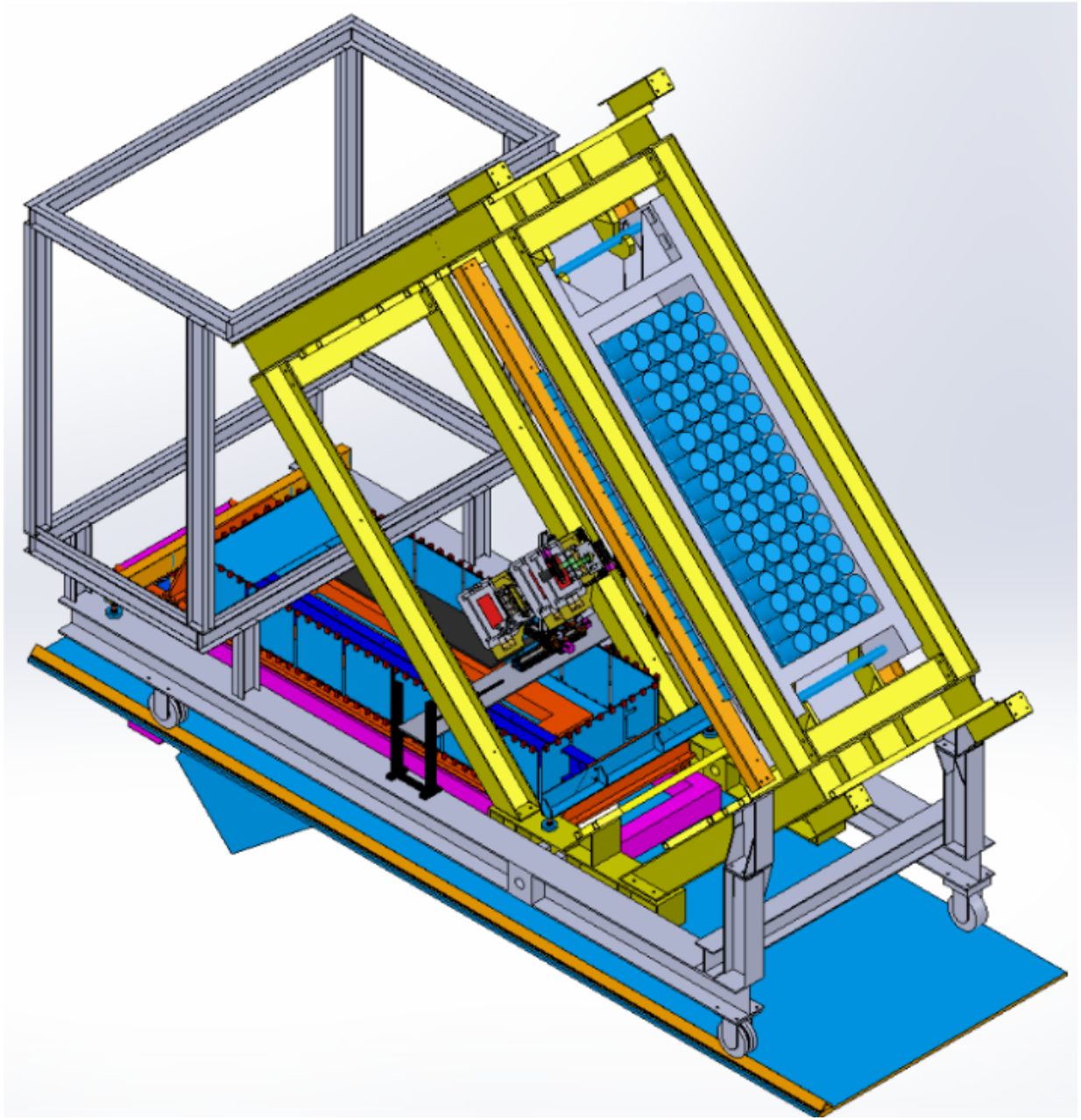
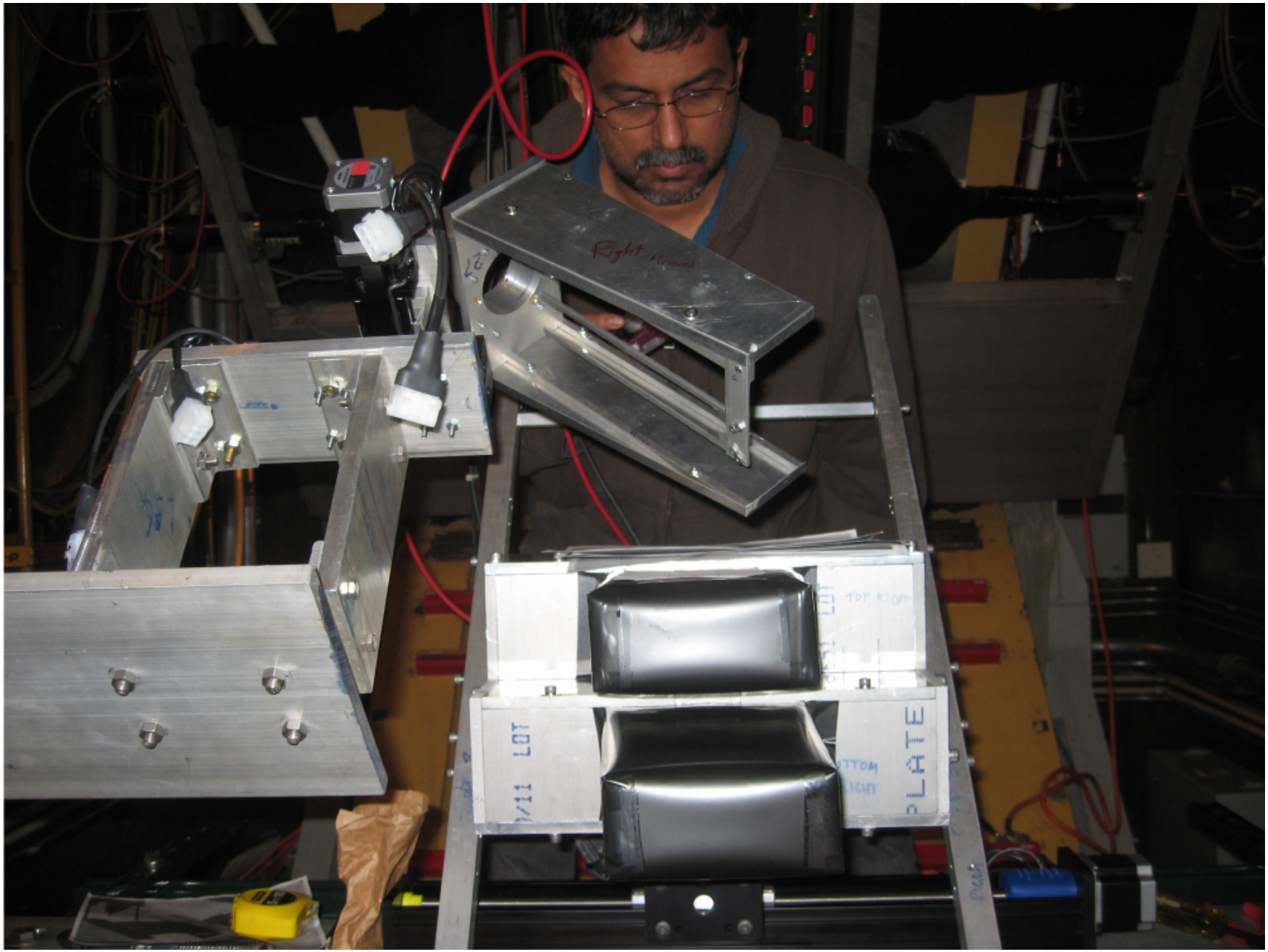
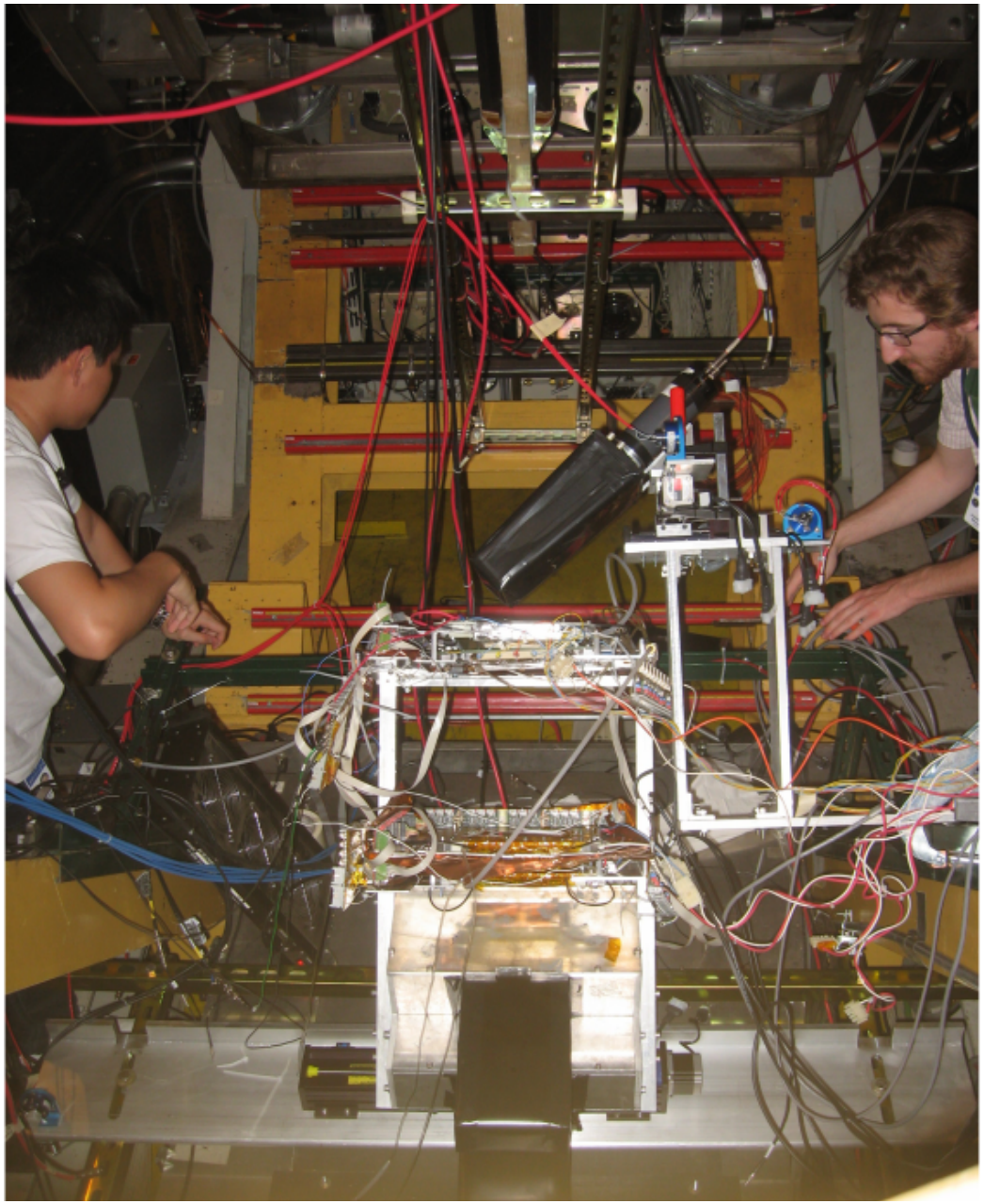


A_T Det photo (RHRS) from PREX-I



A_T Det photo (LHRS) from PREX-I



Summary

- PREX-II/CREX main detector design complete
  - Detectors for both arms constructed and ∼ready
  - Quartz geometry finalized: 5 mm by 35 mm by 160 mm
  - Will wrap quartz in black kapton and use no light guide
  - Simulations give 28 peak PE's/e^- with 20% and 24% res. for upstream and downstream, respectively
- GEM stands for main detectors complete
- Motion control software/GUI is nearly complete
- GEM readout system, DAQ, and analysis software development well underway; next steps are to incorporate TreeSearch library for track finding algorithm; then GEM efficiency study
- Last remaining components are in procurement: 7 quartz tiles plus 4 stubby pieces

Summary (continued)

- A_T detector design complete; mounting concept underway
  - A_T detector frames are in machine shop queue; should have before April 1
  - CAD assemblies are getting organized; will hand off to Ryan for finalizing "zero-day" A_T detector placement
  - A_T "plank-stilt" mounts are trivial to procure and build, but will check with Jack
  - Ryan's CAD will tell us the "zero-day" dimensions needed for the mount
- Other items needed for installation
  - Two S0 and two S3 scintillators; saw in Hall before APEX
  - Two large aluminum angle brackets for left and right HRS main dets – will talk to Jack about this